

*ARCHIVE*  
*for*  
RATIONAL MECHANICS  
*and*  
ANALYSIS

*Edited by*  
J. M. BALL & R. D. JAMES

*Volume 148*



Springer

1999

# Archive for Rational Mechanics and Analysis

Founded by C. Truesdell, 1958

Editors: C. Truesdell 1958–1990, J. Serrin 1967–1985, S. S. Antman 1989–1999,

J. M. Ball and R. D. James 1999

---

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

Authors publishing in this journal can, under certain conditions, benefit from library and photocopy fees collected by VG WORT.

Authors of German nationality and those resident in the Federal Republic of Germany, as well as citizens of Austria, Switzerland and member countries of the European Community, may apply to Verwertungsgesellschaft WORT, Abteilung Wissenschaft, Goethestraße 49, D-80336 München/Germany, for detailed information.

According to §4 section 3 of the German Postal Services Data Protection Regulations, if a subscriber's address changes, the German Federal Post Office can inform the publisher of the new address even if the subscriber has not submitted a formal application for mail to be forwarded.

Subscribers not in agreement with this procedure may send a written complaint to Springer-Verlag, Heidelberger Platz 3, D-14197 Berlin/Germany within 14 days of publication of this issue.

Die Zeitschrift sowie alle in ihr enthaltenen einzelnen Beiträge und Abbildungen sind urheberrechtlich geschützt. Jede Verwertung, die nicht ausdrücklich vom Urheberrechtsgesetz zugelassen ist, bedarf der vorherigen schriftlichen Zustimmung des Verlags. Das gilt insbesondere für Vervielfältigungen, Bearbeitungen, Übersetzungen, Mikroverfilmungen und die Einspeicherung und Verarbeitung in elektronischen Systemen.

Fotokopien für den persönlichen und sonstigen eigenen Gebrauch dürfen nur von einzelnen Beiträgen oder Teilen daraus als Einzelkopien hergestellt werden.

Jeder Autor, der Deutscher ist oder ständig in der Bundesrepublik Deutschland lebt oder Bürger Österreichs, der Schweiz oder eines Staates der Europäischen Gemeinschaft ist, kann unter bestimmten Voraussetzungen an der Ausschüttung der Bibliotheks- und Fotokopiertantiemen teilnehmen. Nähere Einzelheiten können direkt von der Verwertungsgesellschaft WORT, Abteilung Wissenschaft, Goethestraße 49, D-80336 München/Germany, eingeholt werden.

Hinweis gemäß § 4 Abs. 3 der Postdienst-Datenschutzverordnung: Bei Anschriftenänderung des Beziehers kann die Deutsche Bundespost Postdienst dem Verlag die neue Anschrift auch dann mitteilen, wenn kein Nachsendeantrag gestellt ist.

Hiergegen kann der Bezieher innerhalb von 14 Tagen nach Erscheinen dieses Heftes bei unserer Berliner Verlagsanschrift (Springer-Verlag, Heidelberger Platz 3, D-14197 Berlin/Germany) widersprechen.

---

# Archive for Rational Mechanics and Analysis

Founded by C. Truesdell, 1958

Editors: C. Truesdell 1958–1990, J. Serrin 1967–1985, S. S. Antman 1989–1999,

J. M. Ball and R. D. James 1999

## EDITORIAL BOARD

- L. AMBROSIO Scuola Normale Superiore, Classe di Scienze M.F.N.,  
Piazza dei Cavalieri 7, 56126 Pisa, Italy. (luigi@ambrosio.sns.it)
- S. S. ANTMAN Department of Mathematics, University of Maryland, College Park,  
MD 20742-4015, USA. (ssa@ayda.umd.edu)
- V. I. ARNOLD CEREMADE, Université de Paris-Dauphine, 75775 Paris Cedex 16,  
France. (arnold@ceremade.dauphine.fr)
- K. BHATTACHARYA Division of Engineering and Applied Sciences, Mail code 104-44,  
California Institute of Technology, Pasadena, CA 91125, USA.  
(bhatta@cco.caltech.edu)
- Y. BRENIER Laboratoire d'Analyse Numérique, Tour 55–65, 5ème étage,  
Université Pierre et Marie Curie, 4 Place Jussieu 75252, Paris  
Cedex 05, France. (brenier@dma.ens.fr)
- A. BRESSAN SISSA, via Beirut 4, 34014 Trieste, Italy. (bressan@sissa.it)
- C. M. DAFERMOS Division of Applied Mathematics, Brown University,  
182 George Street, P.O. Box F, Providence, RI 02912, USA.  
(dafermos@cfm.brown.edu)
- L. C. EVANS Department of Mathematics, University of California, Berkeley,  
CA 94720-0001, USA. (evans@math.berkeley.edu)
- G. FRIESECKE Mathematical Institute, University of Oxford, 24–29 St Giles',  
Oxford OX1 3LB, UK. (gf@maths.ox.ac.uk)
- M. E. GURTIN Carnegie Mellon University, Mathematical Sciences Department,  
Wean Hall, Pittsburgh, PA 15213, USA. (mg0c+@andrew.cmu.edu)
- P. J. HOLMES Department of Mechanical and Aerospace Engineering and  
Program in Applied and Computational Mathematics,  
D-202B Engineering Quadrangle, Princeton University, Princeton,  
NJ 08544, USA. (pholmes@math.princeton.edu)
- D. KINDERLEHRER Carnegie Mellon University, Mathematical Sciences Department,  
Wean Hall, Pittsburgh, PA 15213, USA. (dk3l+@andrew.cmu.edu)
- P.-L. LIONS CEREMADE, Université de Paris-Dauphine, 75775 Paris Cedex 16,  
France. (pierre-louis.lions@ens.fr)
- T.-P. LIU Stanford University, Department of Mathematics, Building 380,  
MC 2125, Stanford, CA 94305, USA. (liu@math.stanford.edu)
- A. MIELKE Mathematisches Institut A, Universität Stuttgart, Pfaffenwaldring 57,  
70569 Stuttgart, Germany. (mielke@mathematik.uni-stuttgart.de)
- G. MILTON Department of Mathematics, College of Science, University of Utah, Salt  
Lake City, Utah 84112-0090, USA. (milton@math.utah.edu)
- S. MÜLLER Max-Planck-Institute for Mathematics in the Sciences, Inselstr. 22–26,  
04103 Leipzig, Germany. (Stefan.Mueller@mis.mpg.de)
- M. ORTIZ Graduate Aeronautical Laboratories, Mail Code 105-50,  
California Institute of Technology, Pasadena, CA 91125, USA.  
(ortiz@atlantis.caltech.edu)
- F. OTTO Department of Mathematics, South Hall, Room 6607, University of  
California, Santa Barbara, CA 93106, USA. (otto@math.ucsb.edu)
- P. RABINOWITZ Department of Mathematics, University of Wisconsin, 480 Lincoln Dr.,  
Madison, WI 53706, USA. (rabinowi@math.wisc.edu)
- C. A. STUART Département de Mathématiques, École Polytechnique Fédérale  
de Lausanne, 1015 Lausanne, Switzerland. (stuart@dma.epfl.ch)
- V. ŠVERÁK School of Mathematics, University of Minnesota, 127 Vincent Hall,  
206 Church St. S.E., Minneapolis, MN 55455, USA.  
(sverak@math.umn.edu)

2

177H1  
XL

1704

5/00 31249-200

NJUL E





# Archive for Rational Mechanics and Analysis

**Copyright.** Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all co-authors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g. as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic databases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

*While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.*

**Special regulations for photocopies in the USA.** Photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0025-2611, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

The Canada Institute for Scientific and Technical Information (CISTI) provides a comprehensive, world-wide document delivery service for all Springer-Verlag journals. For more information, or to place an order for a copyright-cleared Springer-Verlag document, please contact Client Assistant, Document Delivery, Canada Institute for Scientific and Technical Information, Ottawa K1A 0S2, Canada (Tel.: +1-613-993-9251; Fax: +1-613-952-8423; e-mail: [cisti.docdel@nrc.ca](mailto:cisti.docdel@nrc.ca)).

**Subscription information.** ISSN: 0003-9527 (printed version); ISSN: 1432-0673 (electronic version); Volumes 146–150 (4 issues each) will appear in 1999.

**North America:** Recommended annual subscription rate incl. basic LINK license: approx. US \$ 2226.00 (single issue price: approx. US \$ 131.76) including carriage charges. Subscriptions are entered with prepayment only. Orders should be addressed to: Springer-Verlag New York Inc., Journal Fulfillment Service Department, P.O. Box 2485, Secaucus, NJ 07096-2485, USA, Tel.: 1-800-SPRINGER, Fax: +1-201-348-4505.

**All other countries.** Recommended annual subscription rate incl. basic LINK license: DM 3490.00 plus carriage charges (Germany: DM 90.00, incl. VAT; other countries: DM 95.00). SAL or airmail charges are available upon request. SAL delivery is mandatory to Japan, India, and Australia/New Zealand. Volume price: DM 698.00; single issue price: DM 209.40, plus carriage charges. Subscriptions can either be placed via a bookdealer or be sent directly to: Springer-Verlag, Karin Tiks, Postfach 140201, D-14302 Berlin, Germany, Tel.: +49-30-82787-358, Fax: +49-30-82787-448, e-mail: [subscriptions@springer.de](mailto:subscriptions@springer.de).

**Cancellations** must be received by September 30 to take effect at the end of the same year.

**Changes of address.** Allow six weeks for all changes to become effective. All communications should include both old and new addresses (with postcodes) and should be accompanied by a mailing label from a recent issue. According to §4 section 3 of the German Postal Services Data Protection Regulations, the German Post Office can inform the publisher of a subscriber's new address even if the subscriber has not submitted a formal application for mail to be forwarded.

Subscribers not in agreement with this procedure may send a written complaint to Springer-Verlag's Berlin office within 14 days of publication of this issue.

**Back volumes.** Prices are available on request.

**Address queries regarding subscription and delivery to:** Springer-Verlag Berlin, Dagmar Ammon, Fax +49-30-82787-448, e-mail: [subscriptions@springer.de](mailto:subscriptions@springer.de)

**Microform.** Microform editions are available from: University Microfilms International, 300 N. Zeeb Road, Ann Arbor, MI 48106, USA.

**Electronic edition.** An electronic edition of this journal is available via the LINK Information Service <http://link.springer.de>. Information about this edition is available from the e-mail address [access@link.springer.de](mailto:access@link.springer.de) or from the fax number +49-6221-487-288. A new free service, LINK Alert, has been designed to send automatically by electronic mail the table of contents of each issue of this journal with direct links to the abstracts of its papers. Further information and registration forms are available at <http://link.springer.de/alert>.

**Production.** Springer-Verlag, Journal Production Physics, Marlene Hillen, Postfach 105280, D-69042 Heidelberg, Germany, Tel. +49-6221-487-181, Fax +49-6221-487-688, e-mail: [hillen@springer.de](mailto:hillen@springer.de)

**Address for courier, express and registered deliveries.** Tiergartenstrasse 17, D-69121 Heidelberg, Germany  
**Responsibility for advertisements.** Edda Lückermann, Heidelberger Platz 3, D-14197 Berlin, Germany, Tel. (0)30/82787-0, Fax (0)30/82787-300

**Typesetter.** PublicationService Gisela Koch, Wiesenbach, Germany

**Printers.** Saladruck, Berlin, Germany

© Springer-Verlag Berlin Heidelberg 1999

Springer-Verlag GmbH & Co. KG, Berlin, Germany

Printed in Germany



# CONTENTS OF VOLUME 148

ASHWIN, P. & M. FIELD, Heteroclinic Networks in Coupled Cell Systems .	107
CERMELLI, P. & M. E. GURTIN, The Motion of Screw Dislocations in Crystalline Materials Undergoing Antiplane Shear: Clide, Cross-Slip, Fine Cross Slip . . . . .	3
COLLARD, C. & B. MIARA, Asymptotic Analysis of the Stresses in Thin Elastic Shells . . . . .	233
DAMASCELLI, L. , F. PACELLA & M. RAMASWAMY, Symmetry of Ground States of $p$ -Laplace Equations via the Moving Plane Method . . . . .	291
ERICKSEN, J. L., On Groups Occurring in the Theory of Crystal Multi-Lattices . . . . .	145
FIELD, M., see ASHWIN, P. . . . .	107
GALDI, G. P., On the Steady Self-Propelled Motion of a Body in a Viscous Incompressible Fluid . . . . .	53
GURTIN, M. E., see CERMELLI, P. . . . .	53
JUUTINEN, P. , P. LINDQVIST & J. J. MANFREDI, The $\infty$ -Eigenvalue Problem . . . . .	89
LEBEAU, G. & E. ZUAZUA, Decay Rates for the Three-Dimensional Linear System of Thermoelasticity . . . . .	179
LE ROUX, C., Existence and Uniqueness of the Flow of Second-Grade Fluids with Slip Boundary Conditions . . . . .	309
LINDQVIST, P., see JUUTINEN, P. . . . .	89
MANFREDI, J. J., see JUUTINEN, P. . . . .	89
MIARA, B., see COLLARD, C. . . . .	233
PACELLA, F., see DAMASCELLI, L. . . . .	291

RAMASWAMY, M., see DAMASCELLI, L. . . . .	291
SERRIN, J. & H. ZOU, Symmetry of Ground States of Quasilinear Elliptic Equations . . . . .	265
ZOU, H., see SERRIN, J. . . . .	265
ZUAZUA, E., see LEBEAU, G. . . . .	179